REMARKS

Claims 1-17 were pending in the application. By this response, these claims remain pending, and claims 1, 6, and 13 have been amended herein for clarification. The above amendments have been made without raising new issues to consider. Therefore, this response is an appropriate after final response in accordance with 37 C.F.R. §1.116.

Specifically, claim 1 has been clarified, and now specifically recites *a nozzle* from which ink is ejected from the chamber or channel. Claim 6 has also been clarified, and now specifically recites that the at least one passageway conveys fluid at least *from* the fluid chambers or channels. Claim 13 has been amended to correct a discrepancy between the terms "fluid" and "liquid."

Claims 1-3, 6, 8, 9, and 12 have again been rejected under 35 U.S.C. §102(b) as anticipated by Michaelis et al., EP 0 277 703 A1 (Michaelis). Claims 13 and 15-17 have again been rejected as anticipated by Aoki, U.S. 5,976,303 (Aoki). Claims 4, 5, and 7 have again been rejected under 35 U.S.C. §103(a) as obvious over Michaelis in view of Allen et al., EP 0 564 102 A2 (Allen). Claims 10 and 11 have again been rejected as obvious over Michaelis in view of Aoki. Lastly, claim 14 has again been rejected as obvious over Aoki in view of Silverbrook, U.S. Patent No. 6,171,875 (Silverbrook).

Based on the following remarks, the applicants respectfully request reconsideration of the rejections and allowance of claims 1-17.

Rejection of Claims 1-3, 6, 8, 9, and 12

A. Claims 1-3

Independent claim 1 has been rejected as anticipated by Michaelis. To the contrary, Michaelis fails to disclose all of the limitations of claim 1.

To illustrate, claim 1 recites a *fluid chamber*, which is shown and described in the specification, for example, as channels 11 at page 8, lines 24-31 and in FIG. 5. Claim 1 also recites the chambers (channels) as having *actuator means* (electrodes) which are actuable by electrical signals to effect ejection of droplets from the fluid chamber *through a nozzle*. The electrodes are identified at page 8, lines 24-31 and in FIG. 5 as the walls of the channels 11.

Claim 1 further recites a *drive circuit means* (circuit chip 50, flexible circuit 60, drive circuit dies 360, 370) for supplying the electrical signals to the actuator means (electrodes).

The drive circuit means are described at, for example, page 6, lines 11-15 and shown in FIGS. 1 and 3. The drive circuit provides the signals to actuate the electrodes. Therefore, the *actuator means* and the *drive circuit means* are two completely different, distinct elements of the claimed apparatus.

Claim 1 also recites a *conduit means* (ink flow passages 210, 220, 230) for conveying droplet fluid *to and from* said fluid chamber. The conduit means is described at, for example, page 6, lines 17-32, and shown in FIGS. 2 and 3. Because the conduit means conveys fluid to and from the fluid chamber, the conduit means, the channel or chamber, the chamber nozzle are three completely different and distinct claimed elements.

Claim 1 lastly recites the *drive circuit means* as being in substantial thermal contact with said conduit means so as to transfer a substantial part of the heat generated in said drive circuit to said droplet fluid.

Michaelis admittedly discloses: a) channels or chambers 613; b) electrodes or actuator means (actuator walls 603) in the channels; c) ejection nozzles 618 in the channels; d) liquid supply means (tube 42, reservoir 44) for supplying ink to the channels 613, and a drive circuit means 625 for supplying the signals to the actuators 603. *However, Michaelis fails to disclose or suggest the specifically claimed apparatus construction and arrangement.*

For example, Michaelis does not disclose or suggest any means, much less a conduit means distinct from its channels 613, for conveying fluid *both to and from* a fluid chamber. Ink is only conveyed from the reservoir 44 via the tube 42 to the chambers 613, and ink is only ejected from the channels 613 via the nozzles. *Neither the tube 42 nor the channels 613 equates to the recited conduit means.*

Additionally, Michaelis does not disclose or suggest that its drive circuit 625 is in substantial thermal contact with any part of the Michaelis apparatus, much less a conduit means as recited in claim 1. Instead, Michaelis, at col. 10, lines 1-17 describes only that the *electrodes* or shear mode actuators 603 are within and define part of the chambers or channels 613. Neither this excerpt, nor any other part of Michaelis, refers in any way to placement of the drive circuit 625. Further, Michaelis does not disclose or suggest that the drive circuit 625 is disposed in *substantial thermal contact* with any part of the device disclosed therein.

Michaelis fails to teach or suggest all of the limitations of claim 1. Thus, independent claim 1 and corresponding dependent claims 2 and 3 are neither anticipated nor rendered obvious by Michaelis.

B. Claims 6, 8, 9, and 12

Independent claim 6 has been rejected as anticipated by Michaelis. To the contrary, Michaelis fails to disclose all of the limitations of claim 6.

Claim 6 recites at least one droplet ejection unit (unit 10) with a plurality of fluid chambers (channels 11). Claim 6 also recites actuator means (electrode walls of the channels 11) and a plurality of nozzles arranged in a row (rows 20 and 30). Claim 6 further recites that the actuator means (electrodes) are actuable to eject a droplet of fluid from a fluid chamber (one channel 11) through a respective nozzle.

Claim 6, however, also recites additional limitations including a ***support member*** (supporting structure 200) for said at least one droplet ejection unit. The support member is recited as for the *unit* 10, and is described at page 6, lines 17-32 and is shown in FIG. 2, for example. Claim 6 further recites that the support member comprises at least one *droplet fluid passageway* (passages 210, 220, 230) communicating with said plurality of fluid chambers. Thus, the passageway is different and distinct from the channels or chambers 11. Michaelis fails to disclose or suggest this limitation of claim 6.

Claim 6 additionally recites that the passageway is arranged so as to convey droplet fluid *from* said fluid chambers (channels 11) in a direction *substantially parallel* to (see arrow 100 in FIG. 1) the nozzle row (rows 20, 30). Michaelis does not disclose or suggest this limitation of claim 6. Lastly, claim 6 recites that the *passageway* (210, 220, 230) is arranged to *transfer a substantial part of the heat* generated during droplet ejection to said conveyed droplet fluid. Michaelis also fails to disclose or suggest this limitation of claim 6.

The official action has characterized the nozzle plate 617 of Michaelis as the recited "support member." However, the nozzle plate 617 does not have a fluid passageway that communicates with a plurality of fluid chambers, as is recited in claim 6. Instead, the plate 617 has a plurality of conventional nozzles 618. Each nozzle only communicates with a single one of the channels 613. No nozzle 618, or any other part of the plate 617 communicates with a plurality of the channels 613 in Michaelis. Further, no other part of the Michaelis device is a support member for the channels 613. Thus, Michaelis fails to disclose

or suggest a support member with a passageway communicating with a plurality of the chambers or channels, as is recited in claim 6.

Further, no passageway that is distinct from both the channels 613 and nozzles 618 in Michaelis is disclosed as being capable of conveying fluid from its chambers 613. Further, no channel or tube, much a less a passageway as recited in claim 6, is disclosed in Michaelis as conveying fluid in a direction *that is parallel* to a row of the nozzles 618. In contrast, the supply tube 42 conveys fluid only to the channels 613, and only in a direction perpendicular to a row of the nozzles 618. This fluid conveyance direction from a given nozzle is *perpendicular to the row of nozzles*. This is the antithesis of the parallel direction recited in claim 6. Thus, Michaelis fails to disclose or suggest these limitations of claim 6 as well.

Michaelis also fails to disclose or suggest a support member of any kind that is arranged to transfer heat generated during droplet ejection to any location, much less *to conveyed droplet fluid,* as recited in claim 6. There is absolutely no disclosure within Michaelis as to heat transfer to any fluid from any structure. Thus, Michaelis also fails to disclose or suggest this limitation of claim 6.

Michaelis fails to disclose or suggest several limitations of claim 6. Therefore, independent claim 6 and corresponding dependent claims 8, 9, and 12 are neither anticipated nor rendered obvious by Michaelis.

Rejection of Claims 13 and 15-17

Independent claim 13 has been rejected as anticipated by Aoki. To the contrary, Aoki fails to disclose all of the limitations of claim 13. Claim 13 recites a fluid chamber (channel 11), wherein at least part of the **fluid chamber** is formed from a *first material* having a *first coefficient of thermal expansion*. Claim 13 also recites the fluid chamber (channel 11) as having a *port for the inlet* of droplet fluid to the chamber (inlet aperture 930).

Claim 13 also recites a *support member* (support structure 200) for the fluid chamber (channel 11). The support member (structure 200) is recited as including a *passageway* for *supply* of droplet fluid to the inlet port (aperture 930). Claim 13 additionally recites that the **support member** is defined at least in part by a *second material* having a *second coefficient of thermal expansion* that is greater than the first coefficient of the fluid chamber material.

Clearly, claim 13 is directed to a support member adapted to supply ink to the channels or fluid chambers, and the chambers are those adapted to eject ink or fluid therefrom. Aoki fails to disclose or suggest the specific structure recited in claim 13.

To illustrate, Aoki discloses attachment of a polyimide resin material nozzle plate 4 to a piezoelectric ceramic material actuator substrate 2 that defines fluid channels or chambers 3. Thus, Aoki discloses different materials and different coefficients of thermal expansion for these two components. The actuator substrate 2 in Aoki can be equated to the fluid chamber recited in claim 13. ***However, the nozzle plate 4 in Aoki cannot be equated to the support member as claimed.*** The claimed support member is recited as defining a passageway for *supply droplet fluid to the inlet port of the fluid chamber*. In contrast, the Aoki nozzle *plate 4 only provides nozzles 40 for ejection* of fluid from the channels. Thus, the nozzle plate 4 does not meet all of the limitations of the recited support member.

To further illuminate this distinction, Aoki also discloses a *cover plate 8* with *a supply opening 7*. Ink or fluid is supplied to the channels 3 via the opening 7 in the cover plate 8. The cover plate 8 could be equated in some fashion to the claimed support member because each supply fluid to the channels or chambers. However, Aoki discloses that the cover plate 8 is formed from piezoelectric ceramic material at col. 3, lines 52-53. *Thus, the cover plate 8 in Aoki is formed from the exact same material as the actuator/channel substrate 2.* Aoki, therefore, fails to disclose or suggest a chamber or channel formed of one material as claimed and a support member with a supply passageway and formed of a second material as claimed.

Aoki fails to disclose or suggest at least these limitations of claim 13. Independent claim 13 and corresponding claims 15-17 are neither anticipated nor rendered obvious by Aoki.

Rejection of Claims 4, 5, and 7

Dependent claims 4, 5, and 7 have been rejected as obvious over Michaelis and Allen. The combination of Michaelis and Allen does not disclose or suggest all of the limitations of independent claims 1 or 6, from which these claims depend. The missing limitations of claims 1 and 6 with respect to Michaelis are discussed above. Allen fails to disclose or suggest these same limitations.

The combination of Allen and Michaelis fails to disclose or suggest all of the limitations of independent claims 1 and 6. As a result, dependent claims 4, 5, and 7 are not rendered obvious by the asserted art combination.

Rejection of Claims 10 and 11

Dependent claims 10 and 11 have been rejected as obvious over Michaelis and Aoki. The combination of Aoki and Michaelis does not teach or suggest all of the limitations of independent claim 6, from which these claims depend. The deficiencies in Michaelis with respect to claim 6 are discussed above. Aoki also fails to disclose or suggest at least the same missing limitations.

The combination of Aoki and Michaelis fails to disclose or suggest all of the limitations of independent claim 6. As a result, dependent claims 10 and 11 are not rendered obvious by the asserted art combination.

Rejection of Claim 14

Dependent claim 14 has been rejected as obvious over Aoki and Silverbrook. The combination of Aoki and Silverbrook does not teach or suggest all of the limitations of independent claim 13, from which this claim depends. The deficiencies in Aoki with respect to claim 13 are discussed above. Silverbrook also fails to disclose or suggest the same limitations.

The combination of Aoki and Silverbrook, therefore, fails to disclose or suggest all of the limitations of independent claim 13 and, thus, dependent claim 14.

CONCLUSION

The rejections of claims 1-17 are traversed in view of the forgoing remarks. Claims 1-17 are in condition for allowance in view of the foregoing remarks. Reconsideration and withdrawal of the claim rejections are hereby respectfully solicited.

The examiner is invited to contact the undersigned at the telephone number listed below in order to discuss any remaining issues or matters of form that will place this case in condition for allowance.

This paper is accompanied by a Petition for a one-month extension of time to take action. The Commissioner is hereby authorized to charge deposit account 13-2855 of the undersigned's firm for the extension fee.

Respectfully submitted,

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Version Showing Changes Made

Please amend claims 1, 6, and 13 as follows:

1. (Twice Amended) Droplet deposition apparatus comprising:

a fluid chamber having actuator means actuable by electrical signals to effect ejection of droplets from the fluid chamber through a nozzle;

drive circuit means for supplying the electrical signals to the actuator means; and

conduit means for conveying droplet fluid to and from said fluid chamber, said drive circuit means being in substantial thermal contact with said conduit means so as to transfer a substantial part of the heat generated in said drive circuit to said droplet fluid.

6. (Amended) Droplet deposition apparatus comprising:

at least one droplet ejection unit comprising a plurality of fluid chambers, actuator means and a plurality of nozzles arranged in a row, said actuator means being actuable to eject a droplet of fluid from a fluid chamber through a respective nozzle; and

a support member for said at least one droplet ejection unit, said support member comprising at least one droplet fluid passageway communicating with said plurality of fluid chambers and arranged so as to convey droplet fluid [to or] from said fluid chambers in a direction substantially parallel to said nozzle row and to transfer a substantial part of the heat generated during droplet ejection to said conveyed droplet fluid.

13. (Amended) Droplet deposition apparatus comprising:

a fluid chamber, at least part of which is formed from a first material having a first coefficient of thermal expansion, said chamber being associated with actuator means actuable to eject a droplet from the chamber and having a port for the inlet of droplet fluid thereto;

a support member for said fluid chamber and including a passageway for supply of droplet [liquid] fluid to said port, the support member being defined at least in part by a second material having a second coefficient of thermal expansion greater than said first coefficient; and

means for attaching the fluid chamber to the support member in order to substantially avoid transfer of thermal deformation of the support member to said fluid chamber.